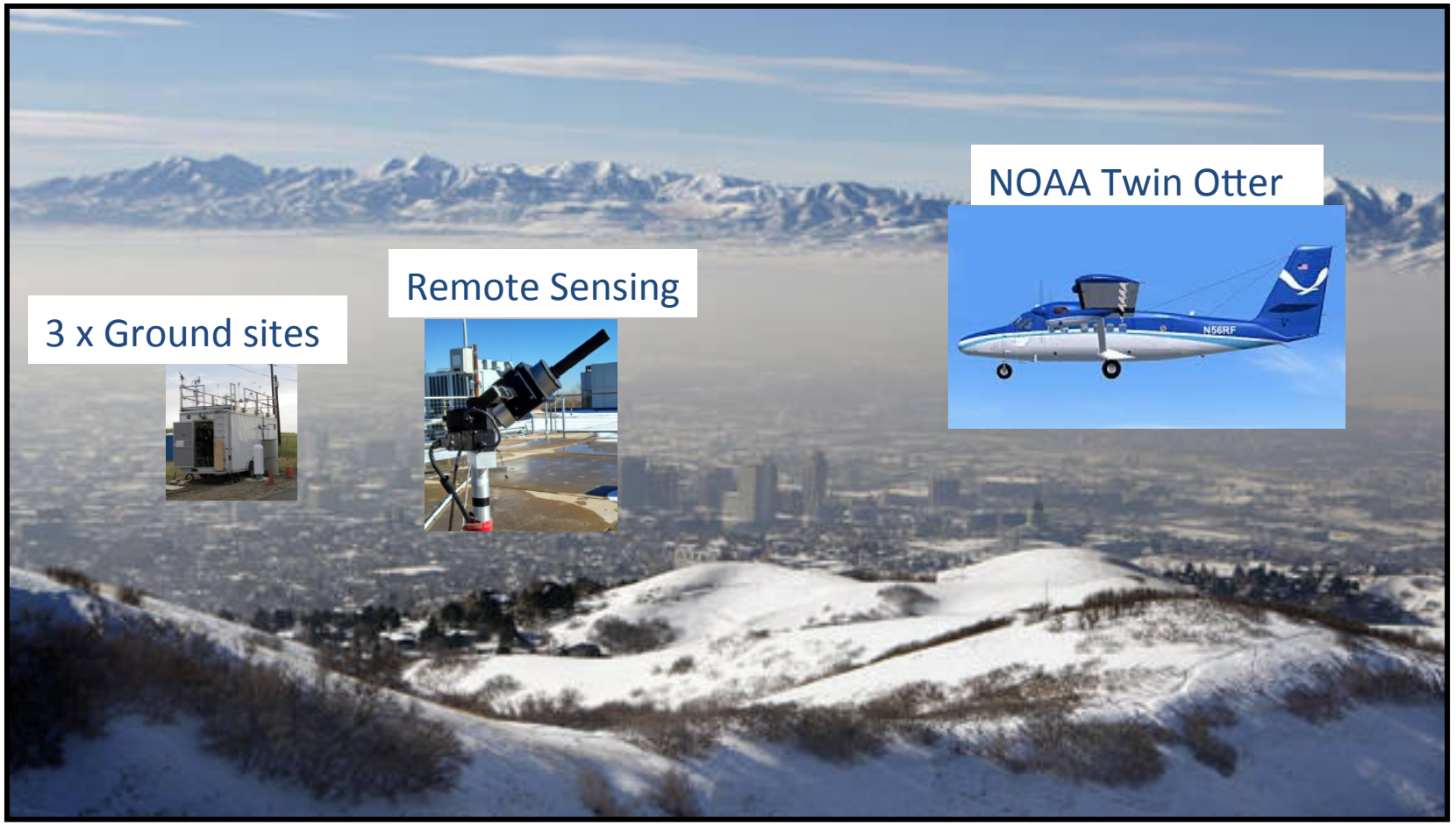
Utah Winter Fine Particulate Study (UWFPS)
January 15 – February 15, 2017
Salt Lake City and Adjacent Basins

Visit http://www.esrl.noaa.gov/csd/groups/csd7/measurements/2017uwfps/

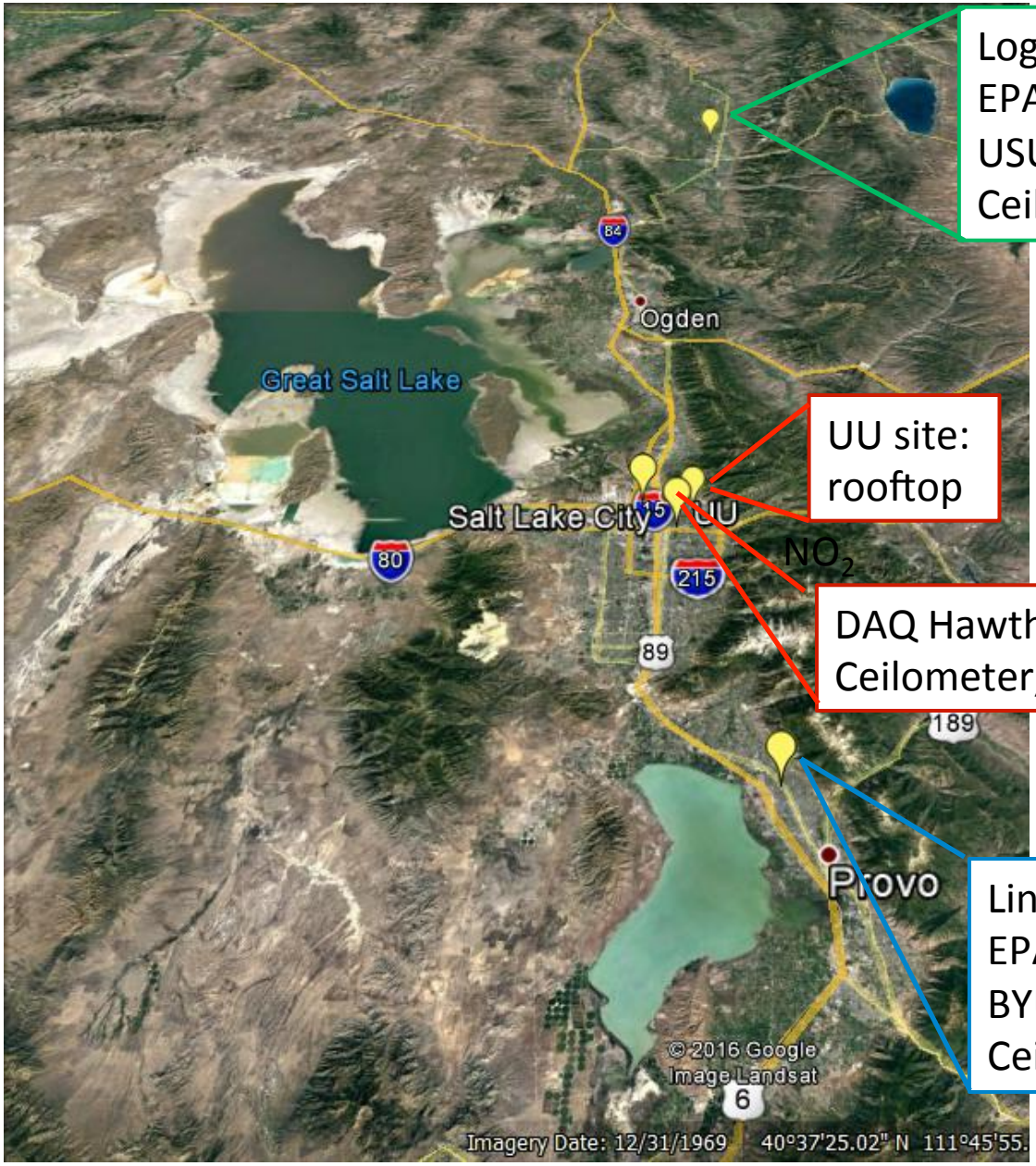
Components of UWFPS

A twin otter aircraft and ground based observations
to investigate the factors governing high $PM_{2.5}$ events in mountain basins of northern Utah



Ground-based Observations

Sites for Ground-based Observations



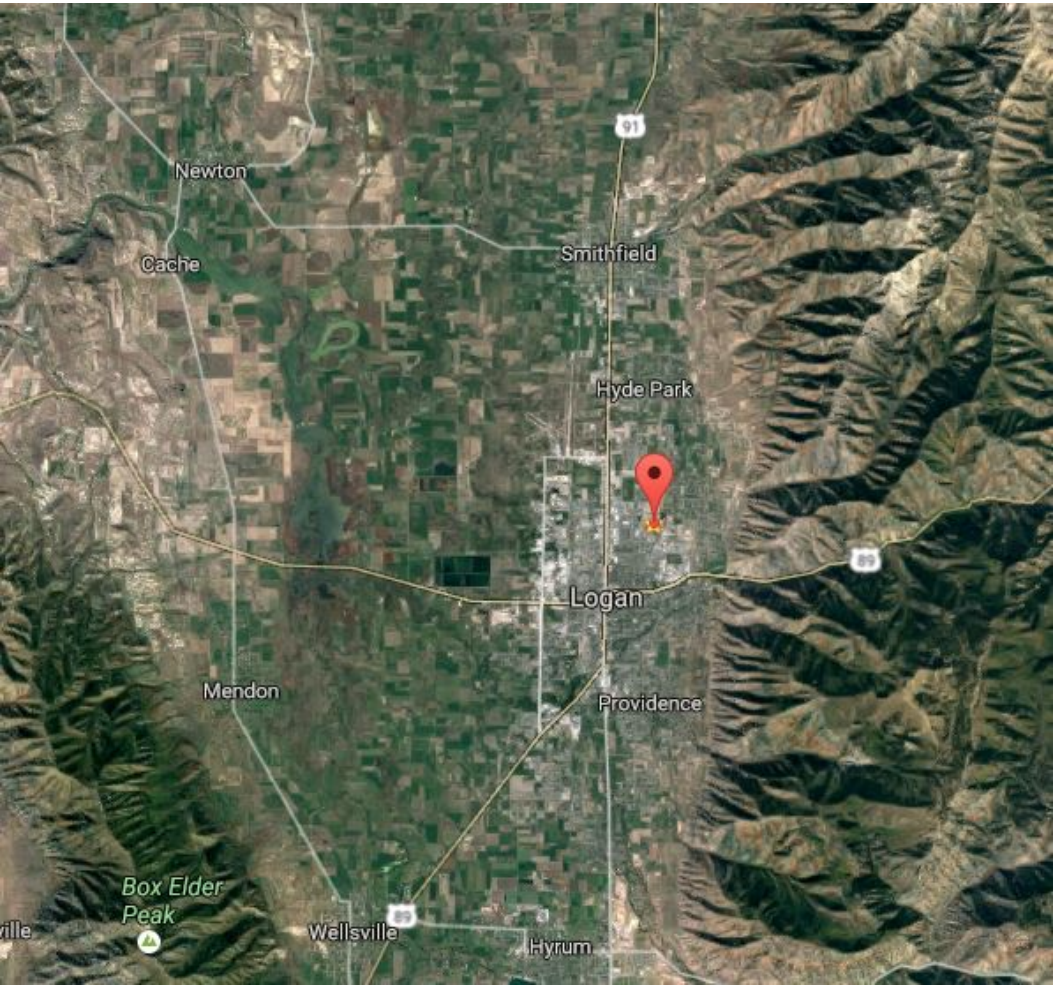
Logan site:
EPA trailer
USU
Ceilometer, PANDORA

UU site:
rooftop
NO_2

DAQ Hawthorne site:
Ceilometer, PANDORA

Lindon site:
EPA
BYU
Ceilometer, PANDORA

Cache Valley : USU Logan, Utah



- Population: ~ 125, 000
- Strong agricultural economy

Cache Valley : USU Logan, Utah

Instrument	Species Measured	PI
<u>Trace gas analyzers</u> T-API T200U T-API T500U CAPS 2B	 NOy, NO, NOy-NO, NO2 only O_3	Dr. Russell Long EPA ORD
~ 60 x canister sampling; 2 per day	VOC speciation	
Aerodyne Iodide CIMS	HNO3, N2O5, ClNO2, HONO	
TSI SMPS and UPC OPC	Size distribution from ultrafines through coarse	
2 x Tisch Hi-Vol samplers	PM composition: OA speciation, EC/OC, inorganic ions, C14, etc	
Aerodyne ToF AMS	Real-time PM_1 composition, size	
Ceilometer	time evolution of aerosol layer	
PANDORA	-Total column measurements of HCHO, NO_2, and O_3, -Altitude profiles	
Vaisala weather transmitter	Met parameters (T, RH, ws, wd etc.)	
??	NH_3	Dr. Randy Martin USU
R & P	OC/EC	

EPA trailer
USU

EPA Trailer

Utah Valley: DAQ's Lindon Station

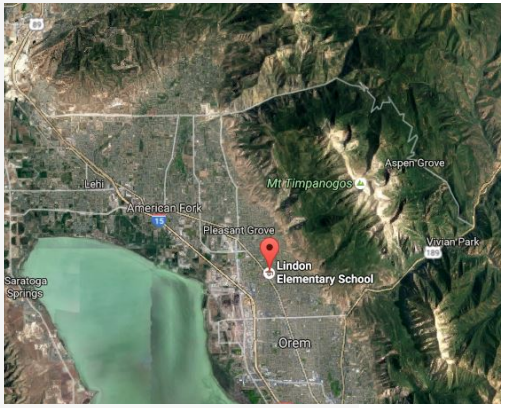
Trailer 1. UDAQ

Trailer 2. BYU

Trailer 1. UDAQ

- Population: ~575, 000

Instrument	Species Measured	PI
<u>Trace gas analyzers</u> Thermo 42iY Aerodyne CAPS 2B	 NOy, NO, NOy-NO, NO2 only O3	Dr. Russell Long EPA ORD
TSI APS	Size distribution from ultrafines through coarse	
2 x PM2.5 samplers	PM composition: OA speciation, EC/OC, inorganic ions, C14, etc	
Ceilometer	time evolution of aerosol layer	
PANDORA	-Total column measurements of HCHO, NO2, and O3, -Altitude profiles	
Organic Aerosol Monitor	Hourly speciated organic aerosol	Dr. Jaron Hansen/ Dr. Delbert Eatough BYU
Sunset	OC/EC	
AIM-IC	PM inorganic composition	UDAQ
	Visibility	
	$PM_{2.5}$, PM_{10}, CO,, met parameters (T, RH, ws, wd etc.)	



Salt Lake Valley: Rooftop Measurements at University of Utah

Atmospheric Sciences Building

Instrument	Species Measured	PI
AIM-IC	PM inorganics, HNO_3, NH3, HONO	Dr. Jen Murphy, University of Toronto
Passive sampler	PM OA speciation	Dr. Brent Williams, Washington University in St. Louis
SMPS; SMPS nano; APS	Size distribution from ultrafine through coarse	Dr. Gannet Hallar (University of Utah)
TEOM	$PM_{2.5}$ mass concentration	UDAQ
Trace gas analyzers	CO, NOx	
Trace gas analyzers	O_3,, CO_2, CH_4	Dr. John Lin group/ Munkh (University of Utah)
VOCs	PTR-MS	Dr. Munkh/ Dr. Dylan Millet (University of Minnesota)
Aerodyne QCL	HCHO	
Aerodyne CAPs	NO_2	Dr. Russell Long, EPA ORD
Pandora	Column HCHO, NO2, O3	
	Met observations, forecasting	Dr. Sebastian Hoch and E. Crossman (University of Utah)

Salt Lake Valley: DAQ's Hawthorn Site

Instrument	Species Measured	PI
SMPS; APS	Size distribution from ultrafine through coarse	Dr. Kerry Kelly (University of Utah)
Wind profile	LiDAR	Dr. Sebastian Hoch (University of Utah)
Ceilometer	Aerosol back scattering	Dr. Russell Long, EPA ORD
Pandora	Column HCHO, NO2, O3	
	$PM_{2.5}$, PM_{10}, PM2.5 speciation, CO,NOx, O3, met parameters (T, RH, ws, wd etc.)	UDAQ

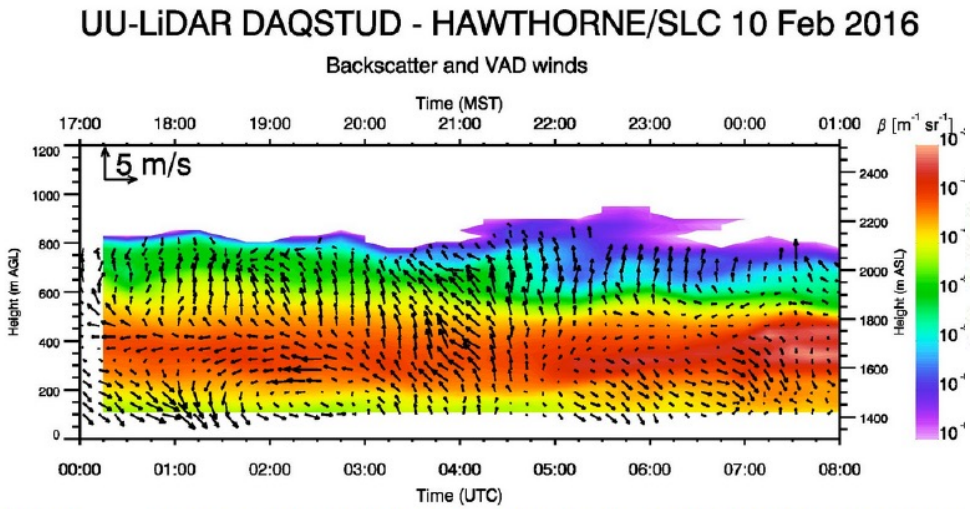
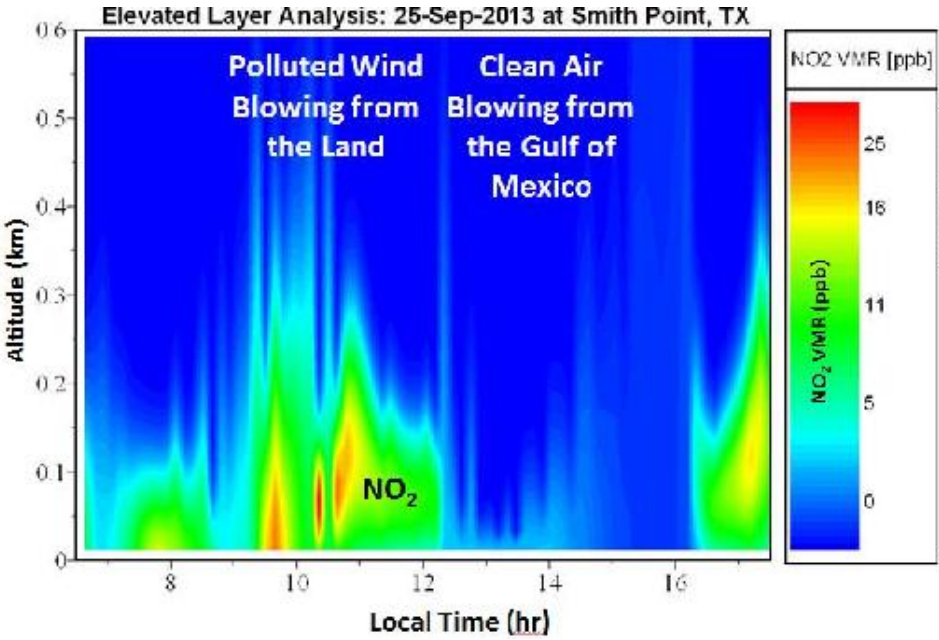
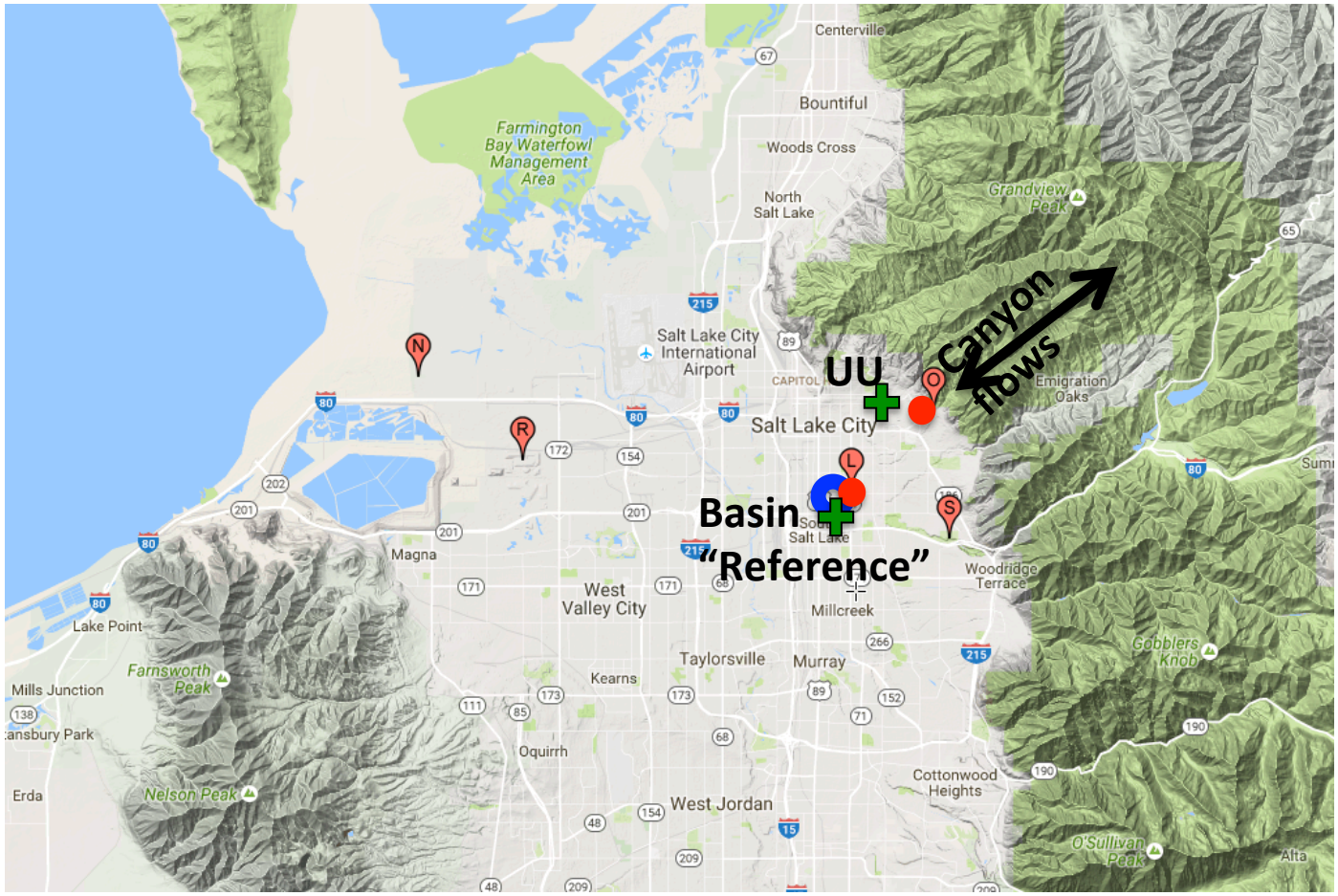


Figure 4: Example quicklook product (subset) showing the Doppler wind lidar retrieved vert profile of the wind field above the Hawthorne (HW) site.



Salt Lake City Basin

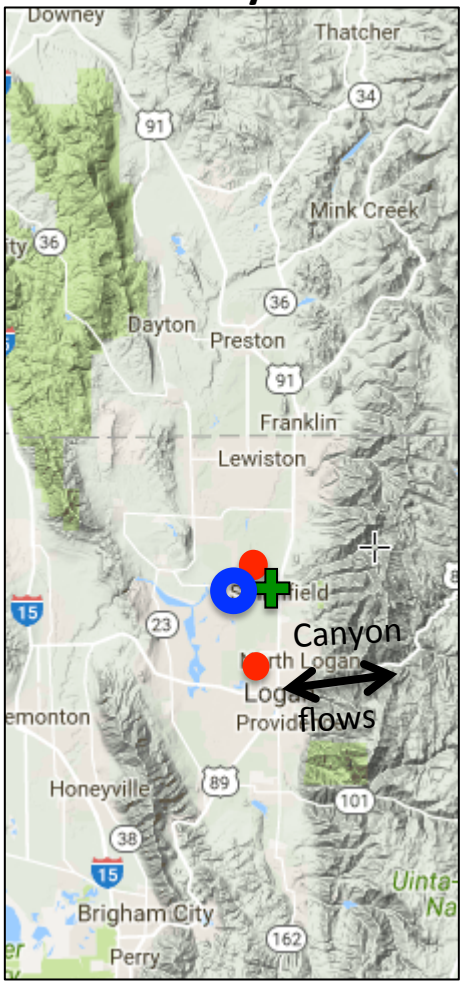


- Ceilometer
- LiDAR / SoDAR
- Pandora

Nighttime thermally driven flows will be the focus.

- Chemistry and dynamics are closely coupled during the pollution episodes.
- Transport of clean air is important in SLV. Need to quantify contributions of photochemistry and transport to oxidant budget.

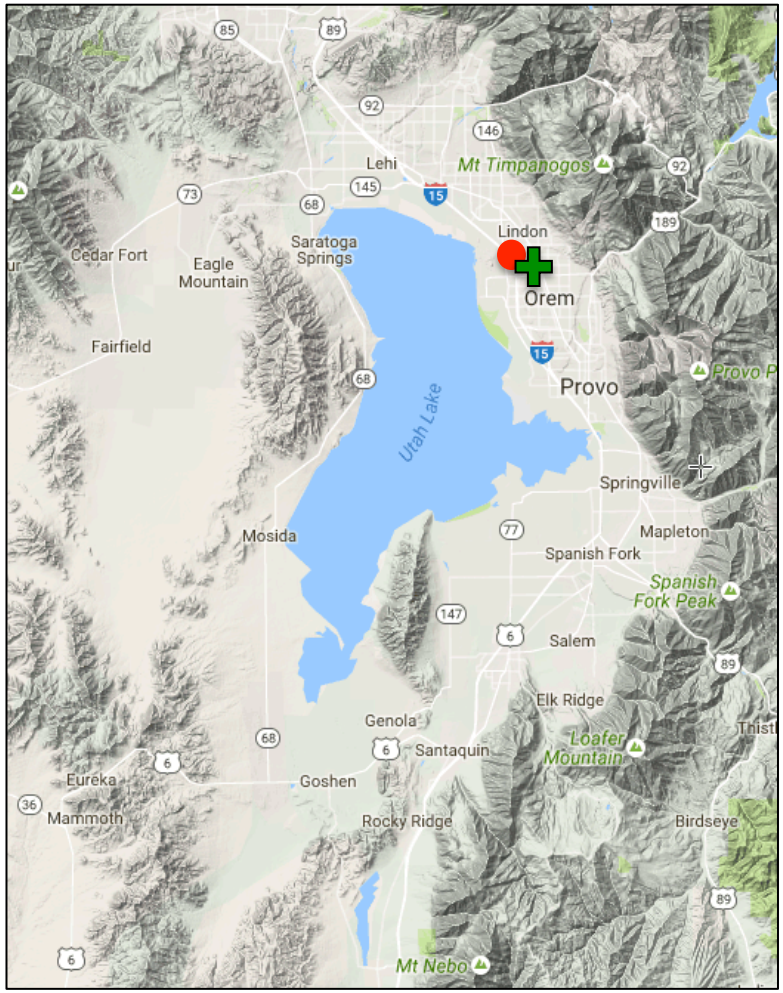
Cache Valley



- **Ceilometer**
- **LiDAR / SoDAR**
- **Pandora**

Co-location of instrumentation is planned to evaluate meteorological processes affecting the surface observations.

Utah Basin



Deployment University of Utah and EPA ORD resources for the UWFPS Project to study transport patterns

Aerosol Backscatter
Wind Profile
Pandora / Chemistry Profile

Salt Lake Basin

Hawthorne: UU LiDAR, ORD ceilometer-1, Pandora-1
Red Butte: UU ceilometer-fixed
UU: UU basic met observations, ORD Pandora-1

Cache Valley

Smithfield: ORD ceilometer-2, Pandora-2
Campbell: CS ceilometer-fixed

Utah Valley

Lindon: ORD ceilometer-3, Pandora-3

Tentative Schedule for Arrival & Installation

Start Date	Instrument	Who
December 15, 2016	Filter based samplers, AIM, CO analyzers, NOx, TEOM	UDAQ; locals
January 2, 2017	AIM-IC PTR-MS others	U. Toronto UMN
January 8-9	EPA trailer, remote sensing devices, analyzers	EPA ORD
	Ground sites : UU, Lindon, Cache	Ground team, BYU, UU met
January 15, 2017	Twin Otter Arrives	Twin Otter Team
February 15, 2017	End of Study	